





CE DECLARATION OF CONFORMITY

CoMoCo B.V., Ambachtsweg 8, 5492 NJ Sint-Oedenrode, The Netherlands, declares that this intelligent motor controller, CoMoCo-1.0-ED-4, has been produced in accordance with the CE guidelines included in the standards below.

It must be installed according to the accompanying instructions.

The intelligent motor controller must not be put into operation before the installation complies with the CE guidelines.

EMC guideline : 2004/108/EC

Low voltage guideline : 2006/95/EC

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1. PREFACE

General

This manual contains the operating and installation instructions for the intelligent motor controller, type CoMoCo-1.0-ED-4.

CoMoCo-1.0-ED-4 is an intelligent controller for electromotors. At the heart of the controller is the Texas Instruments C2000 Piccolo microcontroller. The controller measures the electromagnetic field in the electromotor without using mechanical sensors. The built-in software accurately estimates where the magnetic field will be in the next microsecond. It calculates the minimum and the type of energy required to realise this field and then precisely supplies it, using the data obtained. The result is enormous energy savings in partial load.

Depending on the type of electromotor and the required capacity, up to 90% more energy can be saved in respect to a controller based on Triac. The highest percentage of energy saving occurs when the rotational speed is low. The required rotational speed is controlled by a 0-10Volt or 10-0Volt signal. The rotational speed is guaranteed by the controller, irrespective of external influences.

The controller also ensures that the required rotational speed can be maintained with the absolute minimum of energy. The controller supplies this energy in an optimal form in regard to voltage, current and frequency.

PFC

CoMoCo-1.0-ED-4 fully complies with the CE guidelines. Extra EMC filters are not necessary when installing.

A built-in PFC (Power Factor Control) ensures that the energy is taken evenly from the public grid and is available when required. The controller performs far above the standard set by the energy companies. In addition the PFC is dynamic. In other words it switches off when the load is low to save even more energy.

Input, output and power

The input voltage is between 85 and 265Volt (50-60Hz), both for 1- phase and 3-phase electromotors.

The output signal is suitable for a three phase 230 – 380V induction motor which is delta connected or a single phase induction electric motor 230V where the capacitor of the auxiliary winding is disconnected.

The controller can supply 1,000VA of power with static cooling and when the controller is placed in an air flow up to 1,150VA. The abovementioned applies for a supply voltage of 230VAC.

The controller will operate at a lower voltage, but will automatically reduce the maximum power that can be supplied. The controller will supply a maximum of 500VA at 110VAC.

Extra intelligence

When overloaded the controller will remain working by reducing the supplied power. The controller can run the electromotor at a much lower rotational speed than is usual possible with the current available controllers. Moreover up to 150% of the maximum torque is available at these low rotational speeds and at idle without damaging the motor. In the event of an overload or the temperature is too high or other malfunctions the controller will continue to operate but will also produce an alarm signal via a potential-free contact. The cause of the alarm can be read from a flashing LED signal underneath the controller.

The housing is extremely robust and completely enclosed so that the controller can also be placed in aggressive surroundings.

The direction of rotation of the connected electromotor can be set by the control cable.

Installation

For proper functioning and to conform to the CE rules, the controller must be installed no further than 2.5 metres from the electromotor. The electronics are enclosed in an aluminium housing with a special coating suitable for aggressive surroundings. The housing conforms to the IP67 standard. The required cables have been pre-installed to guarantee IP67 and CE. Opening the controller is therefore unnecessary. Opening will be detected and the guarantee will be void.

It is imperative for optimal working that the motor is recognised and the controller calibrated when connected. This is easy to start up by briefly connecting two of the wires in the control cable to each other.

The procedure will then run fully automatically. The electromotor must be able to move freely. After a short while the controller and motor will be tuned to each other.

2. EXPLANATION OF PICTOGRAMS



Danger!

Risk of electric shock or danger if the following instructions are not observed.



Warning

Read the following text carefully because it contains important information. The working of the controller cannot be guaranteed if this is not taken into account.



Important

Following text contains especially important information.

3. PRECAUTIONARY MEASURES

Read the following instructions carefully before connecting or starting up the controller. Breakdowns and injury could result if the instructions in this manual are not followed.

The manufacturer retains the right to change the specifications of the controller and its performance or the contents of this manual without giving prior notification.

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the controller is protected from overload and overvoltage, we recommend the installation of an additional safety device on the supply circuit alarm system.

The
the IP67

connecting cables are fed through waterproof glands on account of standard.

Do NOT drill extra holes in the housing because this will result in the controller no longer meeting the IP67 standard.



IMPORTANT

Opening will be detected and the guarantee will be void!

4. SCOPE OF DELIVERY

The controller packaging must include the following items:

CoMoCo-1.0-ED-4
Manual



5. CIRCUIT DIAGRAM FOR CONTROLLER

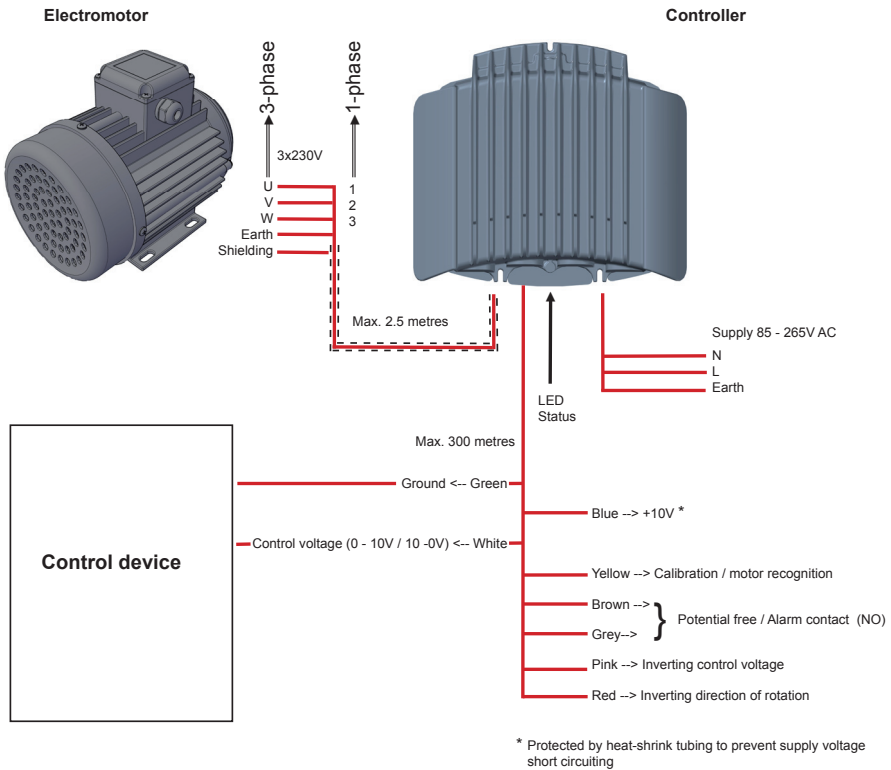
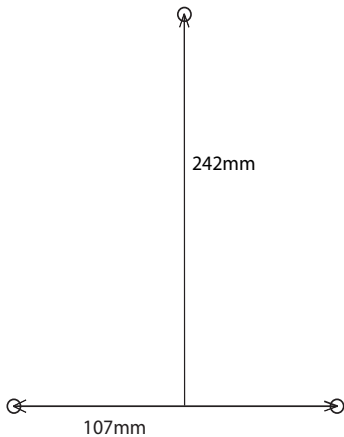


Figure 1. Connections.

6. WALL-MOUNTING THE CONTROLLER



- The distance between controller and motor is max. 2.5 metres.
- It must be mounted on a smooth wall.
- Do not mount the controller above a radiator or anything similar
- Take care of adequate space and air flow around the controller.
- Do not cover.
- Cable feedthrough bottom.
- Do not open.

Figure 2. Wall-mounting of the controller with drilling pattern

7. DUCT MOUNTING THE CONTROLLER

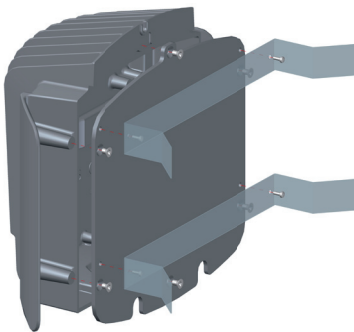
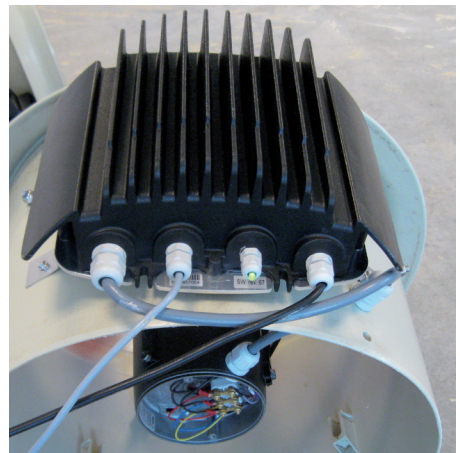


Figure 3. Brackets for installation on duct.

Optional brackets for installing the controller on a duct.
(order number: COMOCO-BRACKET-1)



8. CONNECTIONS

General guidelines for the electric installation and safety

- All work in to the installation, commissioning, remedying breakdowns and maintenance must be implemented by qualified electro-technical personnel (observe EN 50110, EN1010, IEC 60364, IEC 60204 and the national safety precautions therein).



The mains supply must be switched off during installation and repair work.



The controller contains parts that are subject to high voltage when connected to the mains supply. Incorrect connection of the controller could cause damage and physical injury or have fatal consequences. Follow the instructions in this manual, as well as the local and national safety precautions.



IMPORTANT: Motor is delta connected in case of a 3-phase control (output voltage is 3x230V).



Contact with electrical parts could lead to serious physical injury or death even when the mains supply is switched off. Wait for 5 minutes after the mains supply has been switched off before starting work.

- The user or installer is responsible for correct earthing and protection in accordance with the applicable local, national and international regulations.
- The voltage supply to the controller unit must have a series fuse. See the maximum voltage use in the table of technical data (chapter 11) for the control unit for the correct value.
- The earth leakage protection on the control unit amounts to more than 3.5 mA (AC). According to the EN61800-5-1 standard, the required safety circuit must conform with one or more of the following conditions:
 - **A second earth wire with the same cross section as the original earth wire connected to an extra terminal clamp.**
 - **Or the earth wire must have a cross section of at least 10 mm² Cu or 16 mm² Al along the whole connection.**
 - **Or a provision for the automatic interruption of the power supply in the case the earth wire being interrupted.**
- The controller could cause a direct current in the earth wire.
If a circuit breaker is used in the case of direct or indirect contact protection, a circuit breaker type B must be used in the supply wire to the control unit.

General guidelines for installing the controller

The method of installing the wiring and the accompanying components is important for proper working and compliance to the applicable regulations when using the controller.

A number of important points for attention:

- Motor cable may not be extended.
- Connect the motor directly to the controller. Make sure there are as few as possible junctions in the cable (i.e. terminals) between controller and motor.
- Strip the motor cables as short as possible and connect the shielding to earth on 2 sides.
- Do not put the cable between the controller and the motor in the same cable duct as the supply cables, control voltage cables and signal cables.
- All signal cables must be as close to each other as possible and of course as far as possible from the cable between controller and motor.
- Two-sided earthing is imperative for shielding from the low frequency interference voltage.
- Do not run signal cables and cables parallel between controller and motor, keep a distance of at least a half metre and keep crossover points at an angle of 90°.
- If the earth shield on the cable between controller and motor has to be interrupted, install the earth shield with a reliable terminal (EMC) on a wide flat conductor. A reliable (EMC) terminal clamps the shield as completely as possible and makes a connection with an impedance for high frequency signals that is as low as possible.
- Safety earth and earthing for suppression may be combined, however the earth connection for suppression must have an impedance that is as low as possible. Therefore no long wires but as short as possible and a strip or board that is as wide and flat as possible.

Control cable

Various functions of the intelligent motor controller can be adjusted via the control cable:

- Adjustment of the rotational speed by means of a control voltage (0-10V or 10-0V)
- Starting calibration
- Alarm output (potential free); Normally Open (NO)
- Inverting control voltage (10 - 0V)
- Inverting direction of rotation

An overview of the control cable wires can be found in the table below.

Control cable connection colours	Description
Green	Ground
Blue	10V max. 10mA
White	Control voltage (0 -10V / 10 - 0V)
Yellow	calibration / motor recognition
Brown	Potential free / Alarm contact (NO)
Grey	
Pink	Inverting control voltage
Red	Inverting direction of rotation



Figure 4. Control cable wires.



IMPORTANT: The controller can suffer irreparable damage if the control cable wires unintentionally short-circuit.

Adjustment of rotational speed by means of external control voltage

The rotational speed of the electromotor can be adjusted by means of a control voltage from external control equipment. The control voltage for this controller must be connected as shown in figure 5.

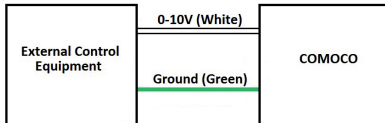


Figure 5. Adjustment by means of external voltage.

In most cases the external control equipment will supply a control voltage of 0-10V at the minimum and maximum rotational speed percentage respectively. The controller will work inverted if this control voltage amounts to 10-0V in the same situation. If the control voltage cannot be inverted via the external control equipment it will be necessary to adjust this inversion on the controller. This inversion can be adjusted by connecting the pink wire (inverting control voltage) and the green wire (ground) of the control cable to each other.

Adjustment of the rotational speed by means of variable resistance (potentiometer)

The rotational speed of the electromotor can be adjusted by means of a variable resistance which must be connected according to figure 6.

The variable resistance value must be 10kOhm linear.

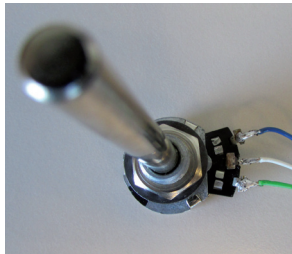
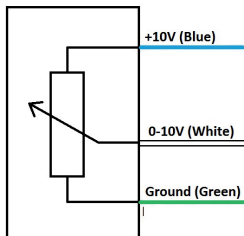


Figure 6. Adjustment by means of variable resistance.

Set direction of rotation

The direction of rotation can be adjusted by connecting the red wire (invert the direction of rotation) and green wire (ground) of the control cable to each other.



IMPORTANT: The 10V wire may only be used to create a control voltage by means of a variable resistance (potentiometer) as shown in figure 6. Protected ex-factory in heat-shrink tubing to prevent the supply voltage from short circuiting.

Supply cable connection

The controller is supplied with mains voltage by the supply cable.

It is advisable to connect the motor and control cable prior to connecting the supply cable. An overview of the connections of the supply cable can be found in the table below.

Supply cable connection colours	Description
Brown	Phase (L)
Blue	Null (N)
Yellow / green	Earth



Figure 7. Supply cable wires.

Motor cable connection 3-phase

The motor cable connects the electromotor to the controller. The wires in this cable are numbered and correspond to the three motor phases shown in figure 8. The direction of rotation must be checked if the motor connections (U, V, W) are not known.

Any 2 phases must be swapped if it does not rotate in the required direction. An overview of the connections of the motor cable can be found in the table below.

Motor cable	Description
1	Motor phase U
2	Motor phase V
3	Motor phase W
Yellow / green	Earth
Shielding	Earth



Figure 8. Motor cable wires.

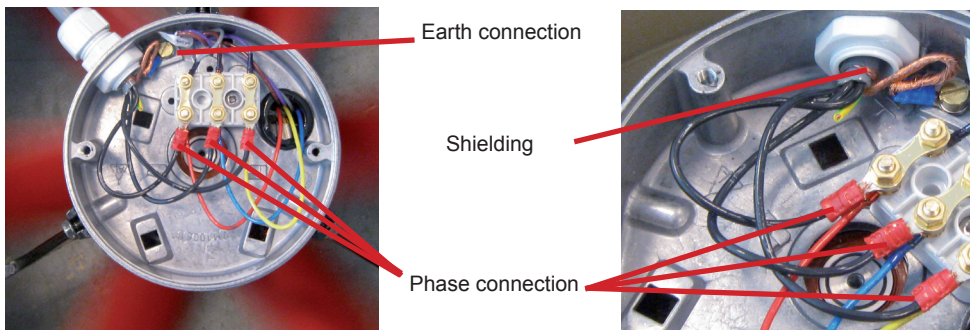


Figure 8. Connections 3-phase.

Motor cable connection 1-phase

A single phase electric motor can be connected according to the following connection diagram on the drive. A standard single phase electric motor uses a so-called capacitor which is redundant in case of connection to the controller. Short-circuit the capacitor or remove it to prevent any loose wires.

The released connection of the capacitor should be connected to the auxiliary winding, to be, to motor phase ' 2 ' indicate the drive as in Figure 9. A complete overview of the motor phases of the regulator indicate is described at page 12 ' Motor Cable Connection 3-phase '. In the event that the main winding and auxiliary winding are unknown, these are determined by measuring the resistance of the winding using a multimeter. The resistance of the main winding is always lower than the auxiliary winding.

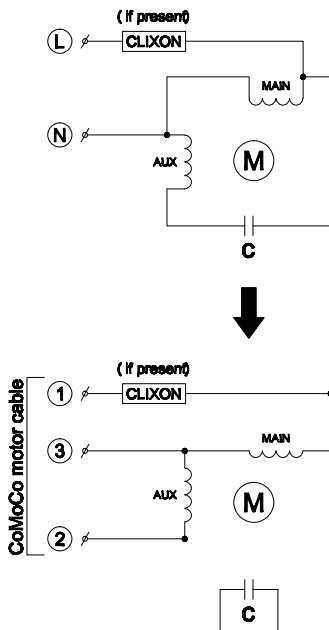


Figure 9. Connection diagram 1-phase.

9. COMMISSIONING

Step 1

Ensure that the electromotor and control cable are connected in accordance with the instructions before supplying mains voltage to the controller. The LED indication on the controller will start to flash as soon as the mains voltage is supplied because the Calibration procedure/motor recognition has not yet been performed.

The LED indication will flash 5 times with pauses of 4 seconds.

Step 2

The Calibration can now be started by connecting the green (ground) and the yellow (calibration) wires in the control cable together for 3 seconds. Make sure that the electromotor can rotate freely. The LED indication will flash green afterwards and the electromotor will make a number of rotations. The calibration is complete as soon as the LED indication lights up green continuously. For 3-phase this is approximately 2 minutes and for 1-phase this is approximately 5 minutes.

Step 3

The controller is now ready for use and the rotational speed of the electromotor can be adjusted using the control voltage. Check the electromotor for correct rotational direction. If the rotational direction differs from what is expected, check the motor connection or check red wire of the control cable as described in chapter 8.



IMPORTANT: The whole commissioning procedure must always be repeated when re-using the controller or replacement of the motor. In that case the red LED will in fact not flash 5 times because all the motor parameters are known from the previous motor. A new calibration is necessary.

10. LED INDICATION

LED description	Indication	Alarm	Cause	Solution
Continuous green	Normal operation			
Flashes green	Calibration			
Continuous red	During switching		DC link precharging	
	During switching		DC link discharging	
Flashes 1 x red with pause of 4 sec.	PFC overflow	•	PFC flow too high	Check quality of the mains voltage and motor status
Flashes 2 x red with pause of 4 sec.	Motor overflow*	•	Motor flow too high	Check wiring and motor status
Flashes 3 x red with pause of 4 sec.	Overtemperature	•	Overload. Controller temp. or ambient temp. too high	Reduce load. Clean controller. Reduce ambient temperature
Flashes 4 x red with pause of 4 sec.	Under or overvoltage	•	Mains voltage too low or too high	Check quality of mains voltage
Flashes 5 x red with pause of 4 sec.	Not calibrated			Calibrate

* If there is a motor overflow alarm, the controller will try to restart the motor after 15 seconds. If the motor over-temperature has not been remedied, for example the temperature of the motor is still too high, a pause of 10 minutes will follow after 3 attempts. The cycle will then be repeated.

11. TECHNICAL INFORMATION

Is identical for 1-phase and 3-phase electromotors.

Supply voltage	85 - 265V AC 50/60 Hz
Consumed power (max.)	1.250W
Output power (max.)	1.000VA (1.150VA in air flow)
PFC factor (cos ϕ)	≥ 0.9
Ambient temperature	-20°C to + 40°C
Control voltage (% of maximum rotational speed)	10 - 0V (1V \approx 100%, 9,5V \approx 6%) 0 - 10V (0,5V \approx 6%, 9V \approx 100%)
Input impedance control signal	25kOhm
Maximum length of motor cable	2,5 metres
Maximum length of control cable	300 metres
Alarm contact (potential free)	1A / 24V DC 0.5A / 120V AC
Dimensions (LxBxH)	280 x 250 x 130mm
Housing	IP67
Weight	5 kg

12. MAINTENANCE

It is advisable to check the controller regularly for dirt. If the openings between the cooling fins are dirty clean them with a brush.

DISCLAIMER

CoMoCo works continuously on the further development of its humidifiers. We therefore reserve the right to modify the design, construction and technology of the product at any time. For this reason, no claims can be made based on the data, illustrations and description in this user manual.

Additional, up-to-date information is available on www.comoco.nl.



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